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# Effect of Chemical Silage Conditioners on Digestibility of Silage[1/]

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The 1953 first cutting of orchard grass-ladino clover mixture (3:1) was ensiled in three 50 ton capacity silos. No treatment was given the forage in the first silo which served as a control. Sodium metabisulfite, 8.2 pounds per ton, was added to the forage in the second silo. To the forage in the third silo a commercial silage conditioner (Kylage), consisting mainly of calcium formate and sodium nitrite, was used at the rate of 5.1 pounds per ton.

The design of the digestion experiment was a Latin square with the three silages fed to three cows in three consecutive periods. Each period consisted of a five-day experimental period which had been preceded by a nine-day preliminary interval on each silage.

The ration fed was silage and grain. Silage was fed ad libitum and the grain was fed in varying amounts in accordance with the milk production of the individual animals. Grain used was a 60:40 mixture of ground corn and crushed oats with salt and bonemeal added at the 1% level.

The silages fed in this experiment had a moisture content of 80% when ensiled. The control silage was characterized by an unpleasant odor and an uneven color since it contained many dark or blackened areas. On the other hand the treated silages had a pleasant odor and appeared uniform in color. In Table 1 certain chemical constituents of the silages are reported to indicate the quality of the silages.

Daily samples of grain, silage and feces were composited for the five-day collection periods. The dry matter and protein content of the silages and feces were determined daily from fresh undried samples taken

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for that purpose. The Sterling-Bidwell toluene method was used for the determination of the dry matter of silages. Samples were analyzed by official methods of the A.O.A.C. for dry matter, protein, ash, ether extract and crude fiber.

Table 1.-Quality of silages as indicated by certain chemical constituents

| | Control silage | Bisulfite treated silage | Kylage treated silage |
|---|---|---|---|
| Carotene | 145* | 175 | 134.0 |
| pH | 4.98 | 4.07 | 4.52 |
| Ammon. Nitrogen as protein | 4.7 | 1.9 | 2.7 |
| Acetic Acid | 3.2 | 2.1 | 3.0 |
| Propionic Acid | 0.7 | 0.2 | 0.3 |
| Butyric Acid | 3.0 | 0.4 | 1.0 |
| Lactic Acid | 1.8 | 6.2 | 4.9 |

* Carotene reported as ug/gram dry matter; all others, except pH, as percentage of total dry matter.

## Results and Discussion

Grain consumption is reported in Table 2, section A. Data on palatability, as indicated by the amounts of dry matter of the silages consumed, is given in section B, Table 2. No significant differences in dry matter consumption were found due to treatment of the silages, periods, or cows, although greater amounts of the treated silages were consumed, approximately 6% more than the control silage. In an accompanying feeding trial of 80 days duration, the dry matter consumption of the treated silages was approximately 20% higher than that of the control silage.

Dry matter digestibility coefficients, recorded in section C of Table 2, revealed no significant differences in digestibility due to silage treatment, periods, or cows. It was noted that the variance for cows approached significance at the 5% level.

References in the literature indicate that the crude fiber digestibility of a ration is frequently lowered upon the addition of readily digested carbohydrate. To test whether this condition applied in this experiment, the crude fiber digestibilities were determined and reported in section D, Table 2. Crude fiber digestibility data showed highly significant differences for cows at the 1% level and no significance for treatment or periods.

Table 2.-Grain and Silage Dry Matter Consumption - Digestibility of Silage Dry Matter and Crude Fiber

| Cows | Control silage | Bisulfite treated silage | Kylage treated silage |
|---|---|---|---|
| Section A - Grain Consumption (pounds per day (dry basis)). | | | |
| 639 | 4.0 - (3)* | 7.7 - (1) | 4.7 - (2) |
| 646 | 6.1 - (1) | 4.4 - (2) | 4.7 - (3) |
| 660 | 9.4 - (2) | 8.6 - (3) | 10.2 - (1) |
| Section B - Silage Dry Matter Consumption (pounds per day). | | | |
| 639 | 16.6 - (3) | 14.5 - (1) | 17.1 - (2) |
| 646 | 16.5 - (1) | 17.8 - (2) | 18.7 - (3) |
| 660 | 12.6 - (2) | 15.9 - (3) | 13.7 - (1) |
| Section C - Silage Dry Matter Digestibility Coefficients | | | |
| 639 | 54.6 - (3) | 55.0 - (1) | 53.4 - (2) |
| 646 | 52.2 - (1) | 55.4 - (2) | 52.5 - (3) |
| 660 | 49.9 - (2) | 51.4 - (3) | 50.5 - (1) |
| Section D - Silage Crude Fiber Digestibility Coefficients | | | |
| 639 | 58.6 - (3) | 54.7 - (1) | 56.7 - (2) |
| 646 | 56.4 - (1) | 59.2 - (2) | 57.3 - (3) |
| 660 | 51.4 - (2) | 51.2 - (3) | 49.8 - (1) |

* Numbers in parentheses represent periods.

Covariance analysis was carried out on the data to discover whether the cow significance obtained was due to cow differences or to the amounts of grain fed. When the amounts of grain were adjusted mathematically to a common basis, it was found that the highly significant differences for cows disappeared. Therefore, the highly significant differences in crude fiber digestibility were due solely to the varying amounts of grain fed.

Table 3 demonstrates the inverse and generally linear relationship between the amounts of grain fed and the crude fiber digestibility. Dry matter digestibility coefficients are also reported for comparative purposes.

Table 3.-Relationships between grain consumed, silage dry matter digestibility and crude fiber digestibility

| Grain fed (pounds per day) | Dry Matter Digestibility | Crude Fiber Digestibility |
|---|---|---|
| | % | % |
| 4.0 | 54.6 | 58.6 |
| 4.4 | 55.4 | 59.2 |
| 4.7 | 52.5 | 57.3 |
| 4.7 | 53.4 | 56.7 |
| 6.1 | 52.2 | 56.4 |
| 7.7 | 55.0 | 54.7 |
| 8.6 | 51.4 | 51.2 |
| 9.4 | 49.9 | 51.4 |
| 10.2 | 50.5 | 49.8 |

## Conclusions

The addition of the two chemical silage conditioners used in this experiment had no significant effect on the dry matter digestibilities of the resulting silages. Nor did the two chemical silage conditioners significantly affect the palatability of the silages although the animals consumed more dry matter from the treated silages.

Concerning the effect of increased carbohydrate intake on digestibility, the evidence of this experiment shows that the added carbohydrate failed to affect significantly the dry matter digestibility of the silage while it did affect crude fiber digestibility in a highly significant manner. The data indicates that the crude fiber component of rations is more sensitive to changes in grain-forage ratios and more suitable than dry matter in studying relationships between changing carbohydrate intakes and the utilization of forage nutrients.